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To:

Lim Chong Chuan
Lim Chong Chuan & Associates
3-1 Jalan 3 / 116D
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PATENT APPLICATION NO: PI 2003 4374

This is to certify that annexed hereto is a true copy from the records of the Registry of Trade Marks and Patents, Malaysia of the application as originally filed which is identified therein.

By authority of the
REGISTRAR OF PATENTS

ABDUL RAHMAN RAMLI
(CERTIFYING OFFICER)
21 November 2003

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CERTIFICATE OF FILING

APPLICANT	:	IQ GROUP SDN. BHD.
APPLICATION NO	:	PI 20034374
REQUEST RECEIVED ON	:	14/11/2003
FILING DATE	:	14/11/2003
AGENT'S/APPLICANT'S FILE REF.	:	P20030554

Please find attached, a copy of the Request Form relating to the above application, with the filing date and application number marked thereon in accordance with Regulation 25(1).

Date : 04/12/2003

(MOHD. AMRAN ABAS)
for Registrar of Patents

To : LIM CHONG CHUAN
C/O LIM CHONG CHUAN & ASSOCIATES,
3-1, JALAN 3/116D,
KUCHAI ENTREPRENEURS' PARK,
OFF JALAN KUCHAI LAMA,
58200 KUALA LUMPUR,
MALAYSIA

Patents F rm No. 1

PATENTS ACT 1983

REQUEST FOR GRANT OF PATENT
[Regulation 7(1)]

To: The Registrar of Patents
Patent Registration Office
Kuala Lumpur, Malaysia

For Official Use

Application no: PI 20034374

Filing date: 14-11-2003

Request r ceived on: 14-11-2003

Fee received on: 14-11-2003

Amount: RM200

* Cheque/Postal Order/Money Order/Draft/Cash No:
BHLB 136006

Please submit this form in duplicate together with the prescribed fee.

~~Applicant's~~ Agent's file reference:
P20030554

THE APPLICANT(S) REQUEST(S) THE GRANT OF A PATENT IN RESPECT OF THE FOLLOWING PARTICULARS:

I. TITLE OF INVENTION: AN ALERTING SYSTEM USING A COMMUNICATION PROTOCOL

II. APPLICANT(S) (the data concerning each applicant must appear in this box or, if the space is insufficient in the space below):

Name: IQ GROUP SDN. BHD.

H.S.C. ~~/Passport~~ No:

Address: 149 JALAN SULTAN AZLAN SHAH
TAMAN PERINDUSTRIAN BAYAN LEPAS FASA 1 (FTZ)
BAYAN LEPAS
11900 PENANG

Address for service in Malaysia: LIM CHONG CHUAN & ASSOCIATES, 3-1 JALAN 3/116D, KUCHAI ENTREPRENEURS' PARK, OFF JALAN KUCHAI LAMA, 58200 KUALA LUMPUR.

Nationality: A MALAYSIAN COMPANY

*~~Permanent residence of~~ principal place of business: AS ABOVE

Telephone number: 03-79829887 Facsimile number: 03-79810188

DITERIMA
14 NOV 2003
Pendaftaran Harta Intelek Malaysia

Additional Information (if any):

* *Delete where inapplicable.*

20034374

III. INVENTOR

Applicant is the inventor: Yes ☐ No ☑

If the applicant is not the inventor:

Name of inventor: 1. CHEN WEN CHIN
2. CHEN KUN LI

Address of inventor: INTERQUARTZ (TAIWAN) LIMITED
5TH FLOOR, NO. 16, LANE 130
MING CHUN ROAD, HSIN TIEN
TAIPEI HSIEN, TAIWAN

A statement justifying the applicant's right to the patent accompanies this form:
Yes ☑ No ☐

Additional Information (if any):

IV. AGENT OR REPRESENTATIVE

Applicant has appointed a patent agent in accompanying Form No. 17: Yes ☑ No ☐

Agent's registration number: PA/86/0009

Applicants have appointed _____ to be their common representative.

V. DIVISIONAL APPLICATION

This application is a divisional application ☐

The benefit of the filing date ☐ priority date ☐

of the initial application is claimed inasmuch as the subject matter of the present application is contained in the initial application identified below:

Initial application no: _____

Date of filing of initial application: _____

VI. DISCLOSURES TO BE DISREGARDED FOR PRIOR ART PURPOSES

Additional information is contained in supplemental box:

(a) Disclosure was due to acts of applicant or his predecessor in title ☐

Date of disclosure: _____

(b) Disclosure was due to abuse of rights of applicant or his predecessor in title ☐

Date of disclosure: _____

A statement specifying in mor detail the facts concerning the disclosure accompanies this Form: Yes ☐ No ☐

Additional Information (if any):

VII. PRIORITY CLAIM (if any)

The priority of an earlier application is claimed as follows:

Country (if th earlier application is a regional or international application, indicate th office with which it is filed):

_____

Filing date: _____

Application no: _____

Symbol of the International Patent Classification:

If not yet allocated, please tick ☐

The priority of more than one earlier application is claimed:

Yes ☐ No ☐

The certified copy of the earlier application(s) accompanies this form:

Yes ☐ No ☐

If No, it will be furnished by _____ (dat)

Additional Information (if any):

VIII. CHECK LIST

A. This application contains the following:

1. request
2. description 10 sheet(s)
3. claim(s) 1 sheet(s)
4. abstract 1 sheet(s)
5. drawing(s) 6 sheet(s)

Total 18 sheet(s)

B. This form, as filed, is accompanied by the items checked below:

(a) signed Form no. 17 ☑

(b) declaration that inventor does not wish to be named in the patent ☐

(c) statement justifying applicant's right to the patent ☑

(d) statement that certain disclosures be disregarded ☐

(e) priority document (certified copy of earlier application) ☐

(f) ~~cash~~, cheque, ~~money order, bank draft, postal order~~ for the payment of application fee ☑

(g) other documents (specify) ☐

20034374 14 NOV 2003

IX. SIGNATURE: _____ Date: 14 NOVEMBER 2003

LIM CHONG CHUAN

* (~~Applicant~~/ Agent)

If agent, indicate agent's registration no: PA/86/0009

For Official Use

1. Date application received: _____

2. Date of receipt of correction, later filed papers or drawings completing the application:

_____

* *Type name under signature and delete where inapplicable.*

AN ALERTING SYSTEM USING A COMMUNICATION PROTOCOL

TECHNICAL FIELD

The present invention relates to a general short-range remote control alerting system using a communication protocol. Particularly, the alerting system relates to encoder device(s) having factory pre-set identification (ID) code(s), using a four quadric or higher communication protocol, and a decoder device with a memory device, which is automatically or manually programmed to store and verify the ID code(s) from and respond to the encoder device(s).

BACKGROUND OF THE INVENTION

United States Patent Number 5,365,214 discloses a musical wireless alerting system. It includes several detectors which transmit radio-frequency (RF) signals to a common receiver. The detectors include manual switches thereon to allow manual selection of a song or melody. The selection is coded in the form of an audio code which is transmitted to the receiver. The receiver detects any RF transmissions and verifies that the received transmissions are identifiable with the receiver. Upon verification, the receiver reads the audio code and compares same to a plurality of stored songs or tunes within memory for transmission to a speaker which plays the song or tune. Each of the detectors may sense different predefined conditions and indicate different audible indications to be played. The detectors may sense conditions such as opening of the door or depression of a doorbell.

Prior art teaches a general short-range remote control device which comprises an encoder or a transmitter with an encoder (herein called encoder device) and a decoder or a receiver with a decoder (herein called the decoder device). The encoder device is mainly designed

to provide a common house code and unique data codes to allow the decoder device to respond and function accordingly. The house code is normally achieved by a dual in-line package (DIP) switch with eight positions to provide 256 different combinations. For recognition, both the encoder and the decoder devices should match their house code, or else the decoder device would not be able to respond to the command of the encoder device.

As mentioned above, since the existing prior art can only provide limited number of house codes to choose from, it is difficult to avoid interference from consumer's neighbors who are also using the invention. It could be troublesome to change the house code, because the consumer would not know the codes of their neighbors. Changes need to be made on all encoder and decoder devices. Furthermore, an intruder with the same product can easily interfere this remote control device by changing the house code one by one and it will trouble and inconvenient the consumer(s).

The invention introduces a new concept to provide one unique identification (ID) code for each encoder device which is pre-set or built-in during manufacturing. Through an automatic or manual learning process, the receiver can memorize many ID codes in the electrically erasable programmable read-only memory (EEPROM) integrated circuits (IC) or flash read-only memory (ROM). Once memorized, the contents inside these memory devices will not be lost or changed, even if there is power supply interruption. The receiver will be free from interference from a different transmitter, since its ID code does not match and will not be recognized.

This new concept teaches a separate unique ID code for each encoder device. There must be a wide choice of ID codes for hundreds of thousands of encoder devices, in order to

avoid interference. This is supported by applying a four quadric or higher communication protocol coding arrangement. The arrangement allows for increased transmission power as regulated by Federal Communications Commission (FCC) due to low average on period per duty cycle.

SUMMARY OF THE INVENTION

An alerting system consists of at least one transmitter or encoder device in communication with at least one receiver or decoder device. The transmitter or encoder device has a factory pre-set built-in fixed unique ID code. The ID codes of the various transmitters or encoder devices are different, to avoid interference. There are substantially large number of ID code combinations to choose from. The receiver or decoder device is operable by a receiver circuit, and a microprocessor interfaced with an EEPROM or flash ROM. These ROMs are used to store the ID code(s) of the transmitter(s) or encoder device(s). The receiver of the alerting system would respond with pre-defined function(s), upon successful matching of the ID code from an encoder device with the code stored in the EEPROM or the flash ROM. A four quadric or higher communication protocol realizing the above system is also disclosed. The present invention can be applied to a general short-range remote control alerting system utilizing RF link to operate devices such as doorbells, security lights, home controls and security alarm systems.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 shows a circuit diagram of light emitting diode (LED) push transmitter according to the present invention.

Figure 2 shows the preamble of the transmission protocol used by the present invention.

Figure 3 shows the ID code, original equipment manufacturer (OEM) code, product code,

repeat product code, channel code, repeat channel code, battery code and repeat battery code of the transmission protocol used by the present invention.

Figure 4 shows the four quadric transmission protocol used by the present invention.

Figure 5 shows a circuit diagram of passive infrared (PIR) transmitter according to the present invention.

Figure 6 shows a circuit diagram of remote transmitter according to the present invention.

Figure 7 shows a circuit diagram of contact transmitter according to the present invention.

Figure 8 shows a block diagram of a RF receiver according to the present invention.

DETAILED DESCRIPTION

According to the present invention, an alerting system consists of at least one transmitter or encoder device in communication with at least one receiver or decoder device. The present invention can be applied to a general short-range remote control alerting system utilizing RF link to operate devices such as doorbells, security lights, home controls and security alarm systems.

Each transmitter or encoder device is operable by an application specific integrated circuit (ASIC) assisted transmitter circuit, with a factory pre-set built-in fixed unique ID code. There is a wide choice of ID codes to choose from, for the various transmitters or encoder devices. The receiver or decoder device is operable by a receiver circuit, and a microprocessor which is interfaced with an EEPROM or flash ROM. These ROMs are used to store the ID code(s) of the transmitter(s) or encoder device(s). The receiver of the alerting system would respond with pre-defined function(s), upon successful matching of the ID code from an encoder device with the code stored in the EEPROM or the flash

ROM. The pre-defined functions include playing a musical tune, activating or de-activating a light.

Preferably, each transmitter or encoder device is given a separate and unique ID code through the ASIC. The ID code is set during IC manufacturing by controlling a serial number in sequence and associating with electrified test probes. These probes, which normally are used for Go/No Go validation, fuse the circuit in the ASIC with the ID code. The ID code or address code employs a four quadric or higher communication protocol. Once set, the ID code does not change even if there is power supply interruption. Without these test probes, even the purchaser of the invention cannot change this ID code.

In addition to the above described ASIC approach, the factory pre-setting of fixed unique ID code for each transmitter or encoder device can also be achieved with a microprocessor. The microprocessor can be an one-time-programmable (OTP) type. Alternatively, the microprocessor can be built-in with a flash ROM or with an external EEPROM, the contents in the memory device will not be lost or changed due to any power supply interruptions.

Referring to Figure 1, an ASIC (U1) provides all the functions and acts as a transmitter or encoder device to generate a 1.2 seconds data streams when it is activated by switch S1. The 1.2 seconds data streams once available will be delivered to RF transmission circuit Q1 and then into the air as the remote control signal for receiver. The duration of each data stream is 100 ms, which means that there will be 12 data streams within the 1.2 seconds transmission period. For the time being, the LED lights through relay R8 and diode D1 as indication of transmission when the ASIC (U1) delivers the data streams.

Each data stream includes a preamble (as shown in Figure 2), ID code, OEM code, product

code, repeat product code, channel code, repeat channel code, battery code and repeat battery code (as shown in Figure 3). The data stream is designed with four quadric (refer to Figure 4) as the basis except the preamble and without any synchronization. Therefore, the preamble with four consecutive pulses is there to ease the decoding from the receiver or decoder device.

The quadric code format (refer to Figure 4) makes the protocol more efficient than traditional binary code format. As shown in Figure 4, the receiver or decoder device can convert one data bit as either code 0, 1, 2 or 3 depending on the location of the pulse. By traditional binary code format, it will take two pulses to make four different data. If count from FCC average transmission power regulation in 100 ms, the quadric data format in this invention can help the design to gain extra power limit of around 50%.

The ID code is designed and set when the ASIC is made. By controlling the serial number and associating with electrified test probes, the circuit inside the ASIC is fused with different ID code or address code during wafer or dice testing process of IC manufacturing. Each ASIC is thus provided with a unique ID code as identity recognition. It further ensures that the receiver or decoder device, once programmed with the known ID code(s), would not receive interference from any other ID code that is not pre-programmed. The ID code is unique and is fixed with a total of 266,144 combinations with the present invention. This is quite different from that of traditional design, which takes eight positions DIP-switch to form a total of 256 combinations. These prior art combinations are easily received with interference from neighbors or tampering by an intruder who is accessible to the same design.

The OEM code content was determined by the Input/Output (I/O) pins 8, 9 and 10 to form

a total of eight selections. It is useful to allow different OEM customers in the same market to share the same protocol but without any interference from each other when the OEM code is set during product manufacturing. The receiver or decoder device would verify the OEM code against the same pre-programmed data to EEPROM to differentiate several alerting systems to co-exist in the same market without interacting to each other. When the receiver or decoder device finds that the input code does not match the pre-programmed data, it will ignore the code and the interference will be invalid.

These OEM codes can also be used differently as it may be re-defined by the receiver of the alerting system, if required.

The product code is determined by the I/O pins 11 and 12 to form a total of four different combinations. For example,

a. "0" as Door Push TX,

b. "1" as PIR TX (refer to Figure 5),

c. "2" as Remote TX (refer to Figure 6), and

d. "3" as Contact TX (refer to Figure 7).

Different product codes will provide different features and functions depending on the presentation of the receiver itself and they can be re-defined by the receiver of the alerting system, if required.

There is a repeat product code, which is exactly the same as the product code, acting as parity check. If both the codes are different, the receiver will terminate the decoding process during its normal operation. The repeat product code can be re-defined as different from the above by the receiver of alerting system, if required.

The channel code is given automatically when the ASIC is activated. Referring to

Figures 1, 5, 6 and 7, although the diagrams looked different, they are using the same ASIC. Associated with the product code, the channel code has the following different means:

a. Product code "0": Two channel codes are given as "0" for LED Push when activation comes from pin 13; "1" for Main Push when activation comes from pin 3 (refer to Figure 1).

b. Product code "1": Four channel codes are given as "0" for PIR Day 1 when activation comes from pin 14 and pin 6 is at low level (refer to Figure 5); "1" for PIR Night 1 when activation comes from pin 14 and pin 6 is at high level; "2" for PIR Day 2 when activation comes from pin 15 and pin 6 is at low level; "3" for PIR Night 2 when activation comes from pin 15 and pin 6 is at high level.

c. Product code "2": Four channel codes are given as "0" for Remote 1 when activation comes from pin 13 (refer to Figure 6); "1" for Remote 2 when activation comes from pin 2; "2" for Remote all ON when activation comes from pin 11; "3" for Remote all OFF when activation comes from pin 12.

d. Product code "3": Three channel codes are given as "0" for panic button when activation comes from pin 3 (refer to Figure 7); "1" for Contact ON when activation from pin 2 changes status from OFF to ON; "2" for Contact OFF when activation from pin 2 changes status from ON to OFF.

Each channel code provides different features and functions according to the presentation of the receiver itself and can be re-defined by each receiver, if required.

The repeat channel code is exactly the same as the channel code acting as parity check. If both the codes are different, the receiver will terminate the decoding processing during its normal operation. The repeat channel code can also be re-defined as different from the

above by the receiver of the alerting system, if required.

During code transmission period, the ASIC will also detect the battery voltage level through operations among pins 4, 5 and 6 (refer to Figure 1). Pin 4 acts as the switch to provide power for both the divider and the LED. Relays R6 and R7 act as the voltage divider. A negative temperature coefficient (NTC) resistor is used to compensate the voltage difference, when temperature changes, and maintains the accuracy of the voltage detection. Relay R8, diode D1 and the LED also act as the voltage divider and the transmission indication when the LED is lit. When the battery is new, the voltage level at pin 5 will be greater than at pin 6 and the battery code will be assigned as "0"; or the battery code will be assigned as "1" if the voltage level at pin 5 is less than at pin 6.

The repeat battery code is assigned as the same as the battery code. The repeat battery code can also be re-defined as different from the above by the receiver of the alerting system, if required.

Once the receiver (refer to Figure 8) picks up the data streams from the air through its RF receiver, it will immediately convert the data streams into digital form and starts checking the codes one by one. If the codes are legitimate and the receiver is newly purchased or without pre-programming with any valid transmitter, the receiver will make a response to the transmitter and program the received data stream in the EEPROM as its identity. This 'automatic' programming sequence is time bound. In general, it is intelligent enough to eliminate the need of manually 'programming' the receiver by the user if default function is agreeable. Nevertheless, manual programming provision is made to allow for changes such as alternate functional settings, adding additional transmitter(s) or encoder device(s) at a later stage to the system, or to re-program system configurations, and so on, all with

the assistance of various functional provisions provided by the receiver. Once the ID data stream is stored in the receiver, it will be safely secured in the EEPROM even if power supply of the receiver is removed. Thereafter, when the receiver picks up a data stream from the air, the stored ID data stream in the receiver or decoder device will be recalled for counter-checking. The receiver or decoder device only responds to the transmitter or encoder device when the ID code, the OEM code, the product code and the channel code are matching. With the learning features associated with the receiver or decoder device, the receiver or decoder device will not make any false response to any transmitter or encoder device not pre-programmed to the receiver or decoder device. Preferably, a microprocessor with a built-in flash ROM can be used for ID code storage since the memory contents can be programmed and will not be lost or changed due to power supply interruptions.

CLAIMS

1) A general short-range remote control alerting system consisting of at least one transmitter or encoder device in communication with at least one receiver or decoder device, is characterized in which

each transmitter or encoder device has a factory pre-set built-in fixed unique identification (ID) code, which does not change due to power supply interruption;

the receiver or decoder device utilizes a memory device, the memory of which will not change due to power supply interruption and can be read or written or re-written to store ID codes from the various transmitters or encoder devices,

whereas the transmitter or encoder device transmits ID code to the receiver or decoder device, and upon matching, the receiver or decoder device causes pre-defined functions to be performed, such as a musical tune to be played or a light to be activated or de-activated.

2) An alerting system as in Claim 1 in which the ID code embodies a four quadric or higher communication protocol.

3) An alerting system as in Claim 1 in which the ID code at the transmitter or encoder device, once set, is not changeable by the end user.

4) An alerting system as in Claim 1 in which the receiver or decoder device includes a memory device which can be programmed, automatically or manually, to store the ID code(s).

5) An alerting system as in Claim 1 in which the ID codes of various transmitters or encoder devices have substantially large number of ID code combinations.

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14 NOV 2003

AN ALERTING SYSTEM USING A COMMUNICATION PROTOCOL

ABSTRACT

A general short-range remote control alerting system consists of at least one transmitter or encoder device in communication with at least one receiver or decoder device. Each transmitter or encoder device has a factory pre-set unique identification (ID) code. The receiver or decoder device utilizes a memory device, the memory of which will not change due to power supply interruption and can be read or written or re-written to store ID codes from the various transmitters or encoder devices. The transmitter or encoder device transmits ID code to the receiver or decoder device, and upon matching, the receiver or decoder device causes pre-defined functions to be performed, such as a musical tune to be played or a light to be activated or de-activated. A communication protocol realizing the above system is also disclosed.

The present invention can be applied to doorbells, security lights, home controls and security alarm systems.

(Figure 1)

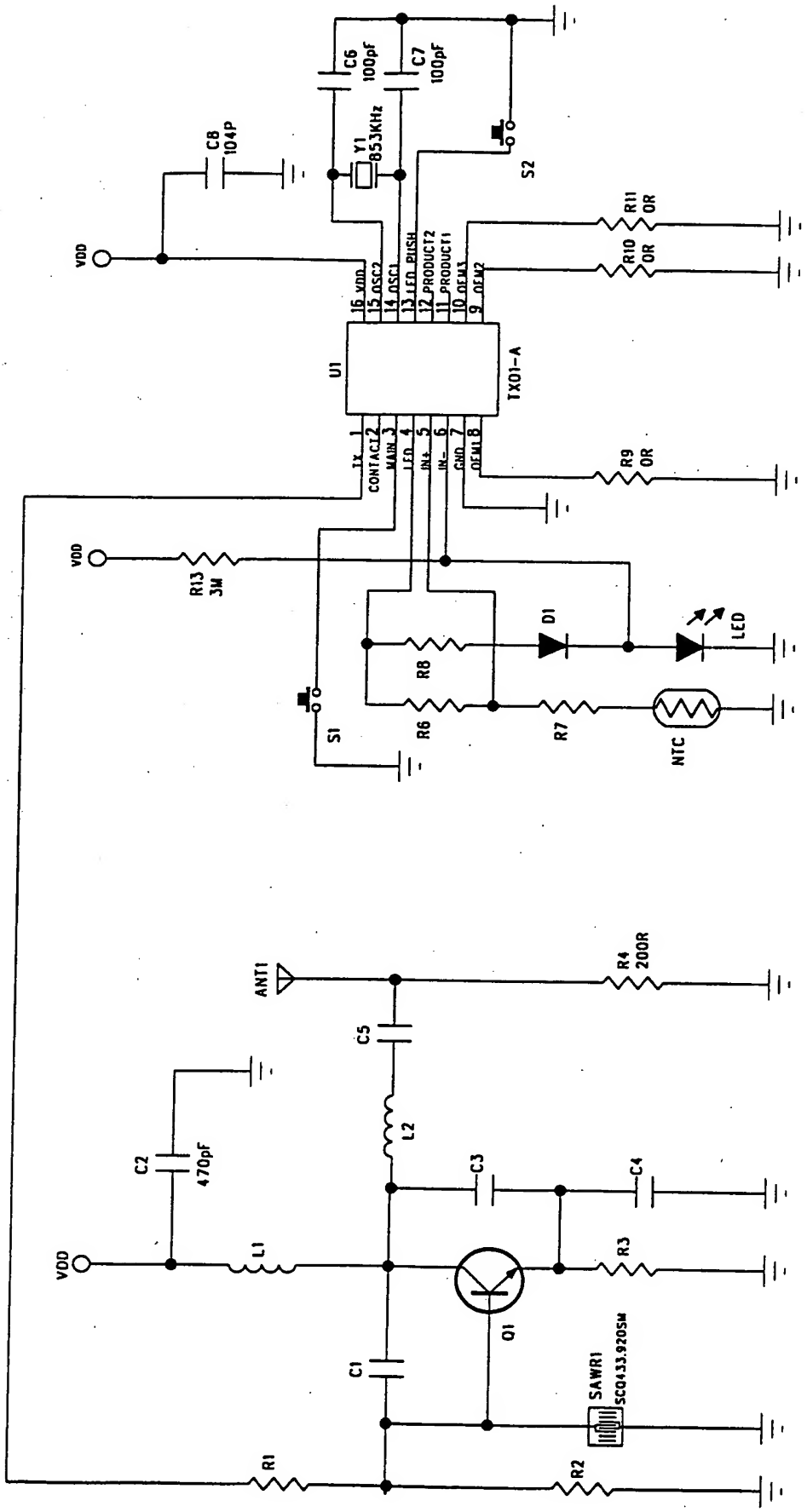

C6
100pF
C7
100pF
C8
104P
Y1
853KHz
S2
R11
0R
R10
0R
VDD
16 VDD
15 OSC2
14 OSC1
13 LED PUSH
12 PRODUCT2
11 PRODUCT1
10 OEM3
9 OEM2
U1
TX01-A
1 TX
2 CONTACT
3 MAIN
4 LED
5 IN+
6 IN-
7 GND
8 OEM1
R9
0R
R13
3M
D1
LED
R8
R6
R7
NTC
S1
ANT1
R4
200R
C5
L2
C2
470pF
C3
C4
L1
R3
Q1
C1
SAWR1
SC0433.920SM
R1
R2

Figure 1

Figure 2

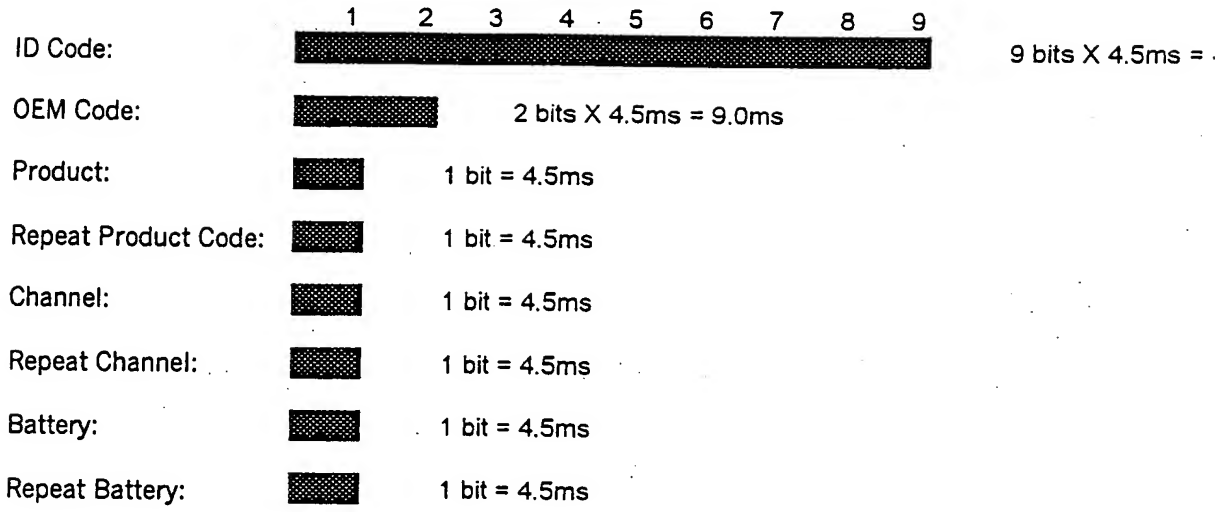


Figure 3

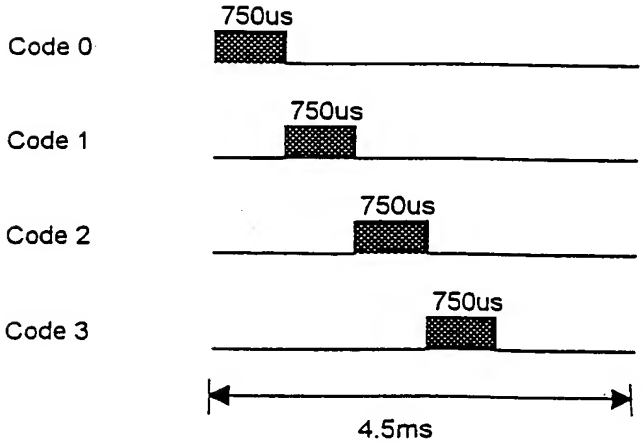
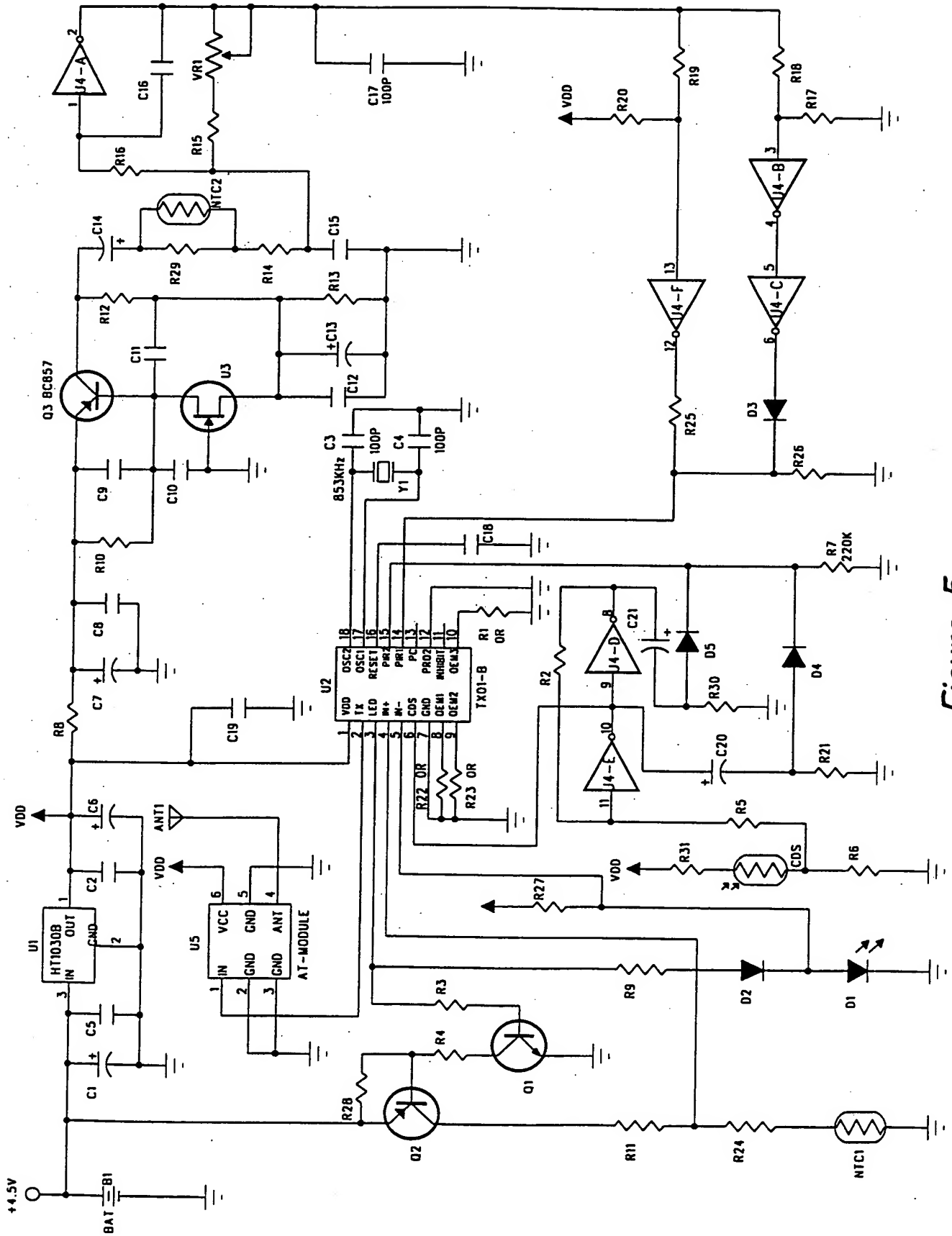


Figure 4


U4-A
U4-B
U4-C
U4-D
U4-E
U4-F
VR1
C16
C17 100P
R15
R16
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C14
C15
R29
R14
R13
R12
C11
C13
C12
Q3 BC857
U3
C3 100P
C4 100P
853KHz
Y1
C9
C10
R10
C8
C7
R8
C18
C19
U2
TX01-B
OSC2
OSC1
RESET
PA2
PA1
PC
PA0
WKUBIT
OEM3
VDD
TX
LED
IN+
IN-
CDS
GND
OEM1
OEM2
R1 OR
R2
R22 OR
R23 OR
C21
D5
D4
R30
R7 220K
C20
R21
R5
R31
CDS
R6
R27
R9
D2
D1
R3
R4
Q1
R28
Q2
R11
R24
NTC1
U1
HT1030B
OUT
IN
GND
C2
C6
C5
C1
ANT1
U5
AT-MODULE
VCC
GND
ANT
IN
+4.5V
B1
BAT
R20
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R18
R17
R25
R26
D3
VDD

Figure 5

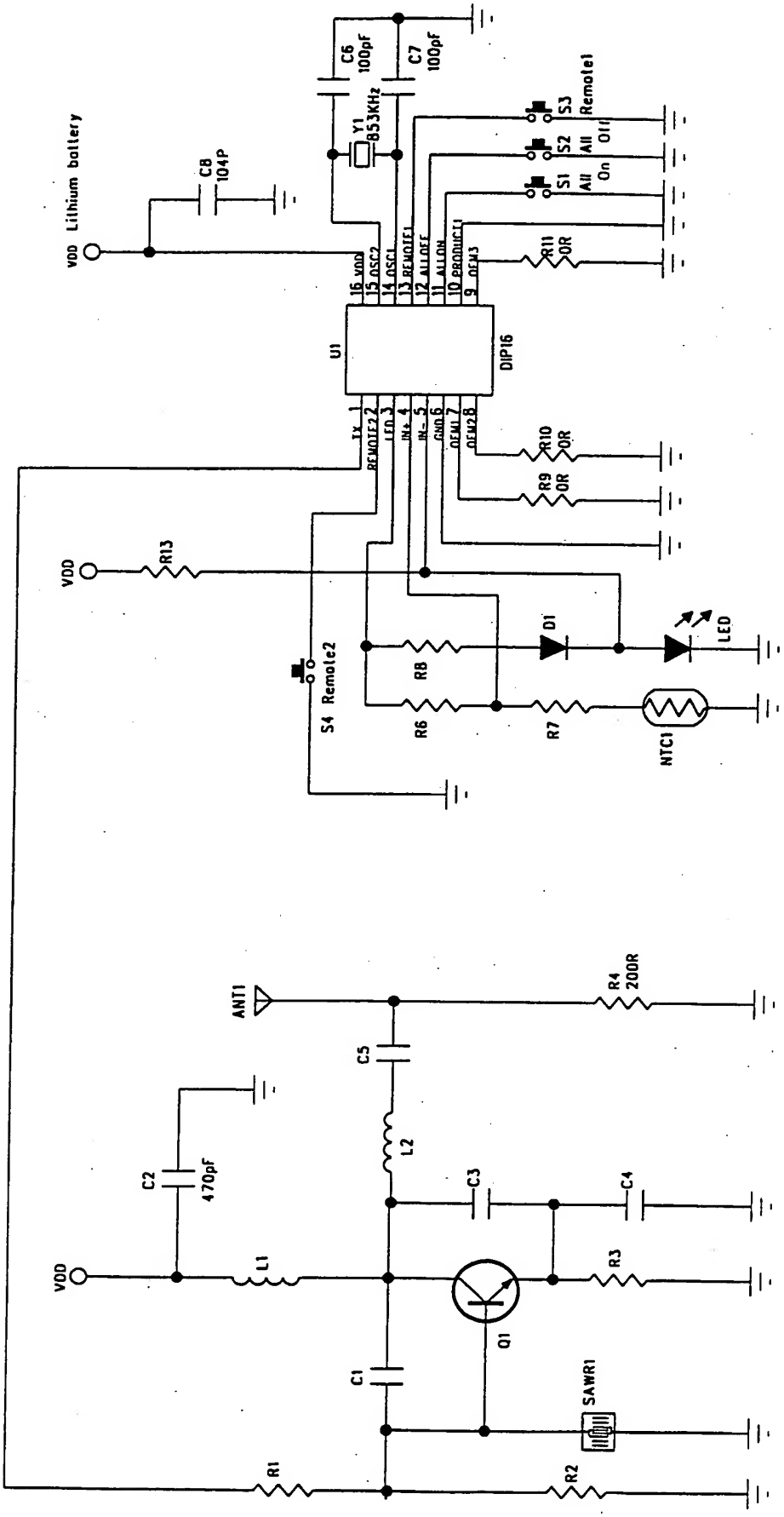
VDD Lithium battery
C8 104P
C6 100pF
C7 100pF
Y1 853KHz
S3 Remote1
S2 All Off
S1 All On
R11 0R
U1
DIP16
16 VDD
15 OSC2
14 OSC1
13 REMOTE1
12 ALLOFF
11 ALLON
10 PRODUCT1
9 OEM3
1 TX
2 REMOTE2
3 LED
4 IN+
5 IN-
6 GND
7 OEM1
8 OEM2
R10 0R
R9 0R
VDD
R13
S4 Remote2
R8
D1
LED
R6
R7
NTC1
ANT1
R4 200R
C5
L2
C2 470pF
C3
C4
VDD
L1
R3
Q1
C1
SAWR1
R1
R2

Figure 6

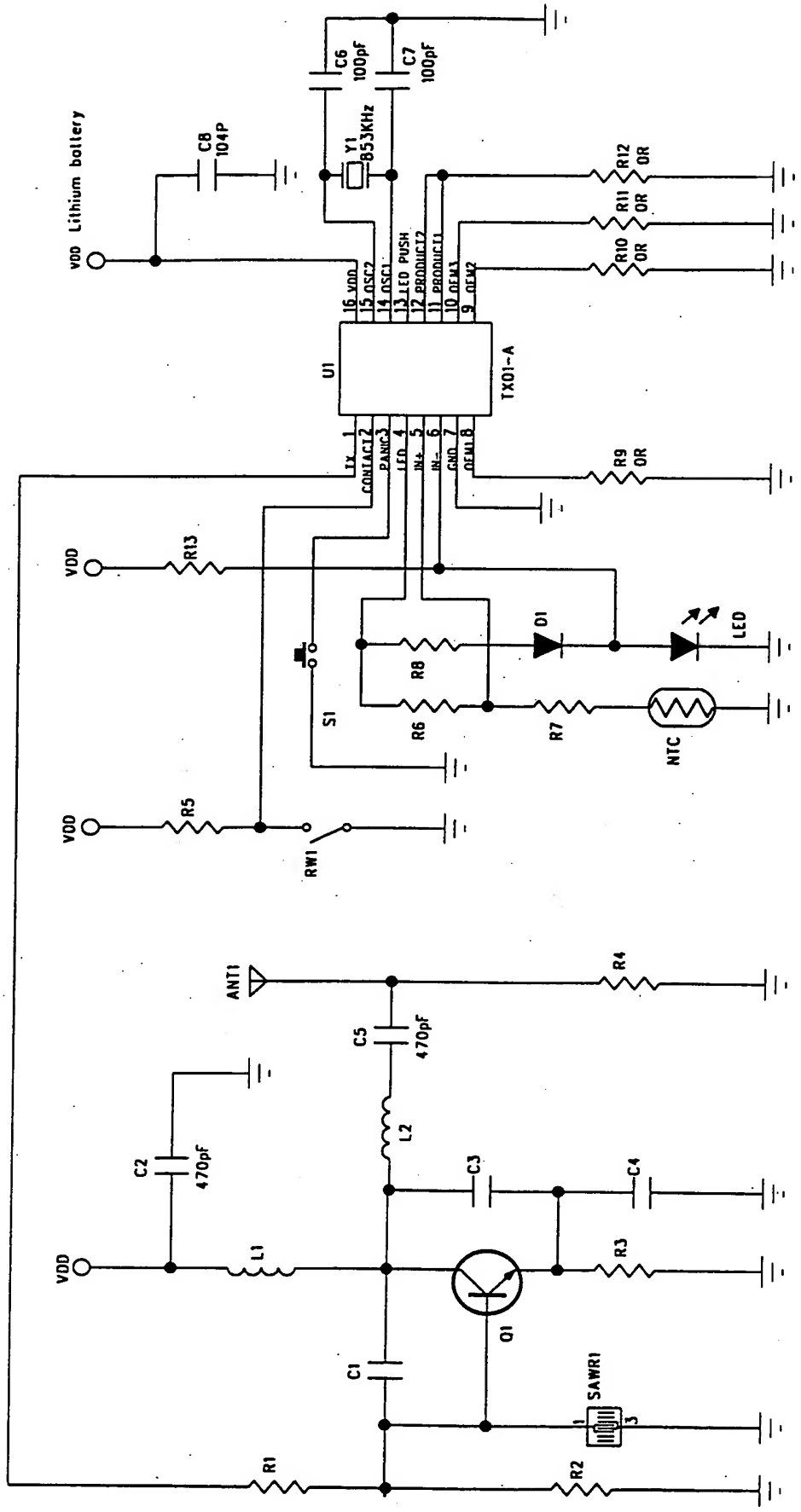
VDD Lithium battery
C6 100pF
C7 100pF
C8 104P
Y1 853KHz
R12 OR
R11 OR
R10 OR
R9 OR
U1
TX01-A
16 VDD
15 OSC2
14 OSC1
13 LED PUSH
12 PRODUCT2
11 PRODUCT1
10 OEM1
9 OEM2
1 TX
2 CONTACT2
3 PANIC
4 LED
5 IN+
6 IN-
7 GND
8 OEM1
R13
D1
LED
R8
S1
R6
R7
NTC
R5
RW1
ANT1
R4
C5 470pF
L2
C2 470pF
C3
C4
L1
R3
Q1
C1
SAWR1
R1
R2

Figure 7

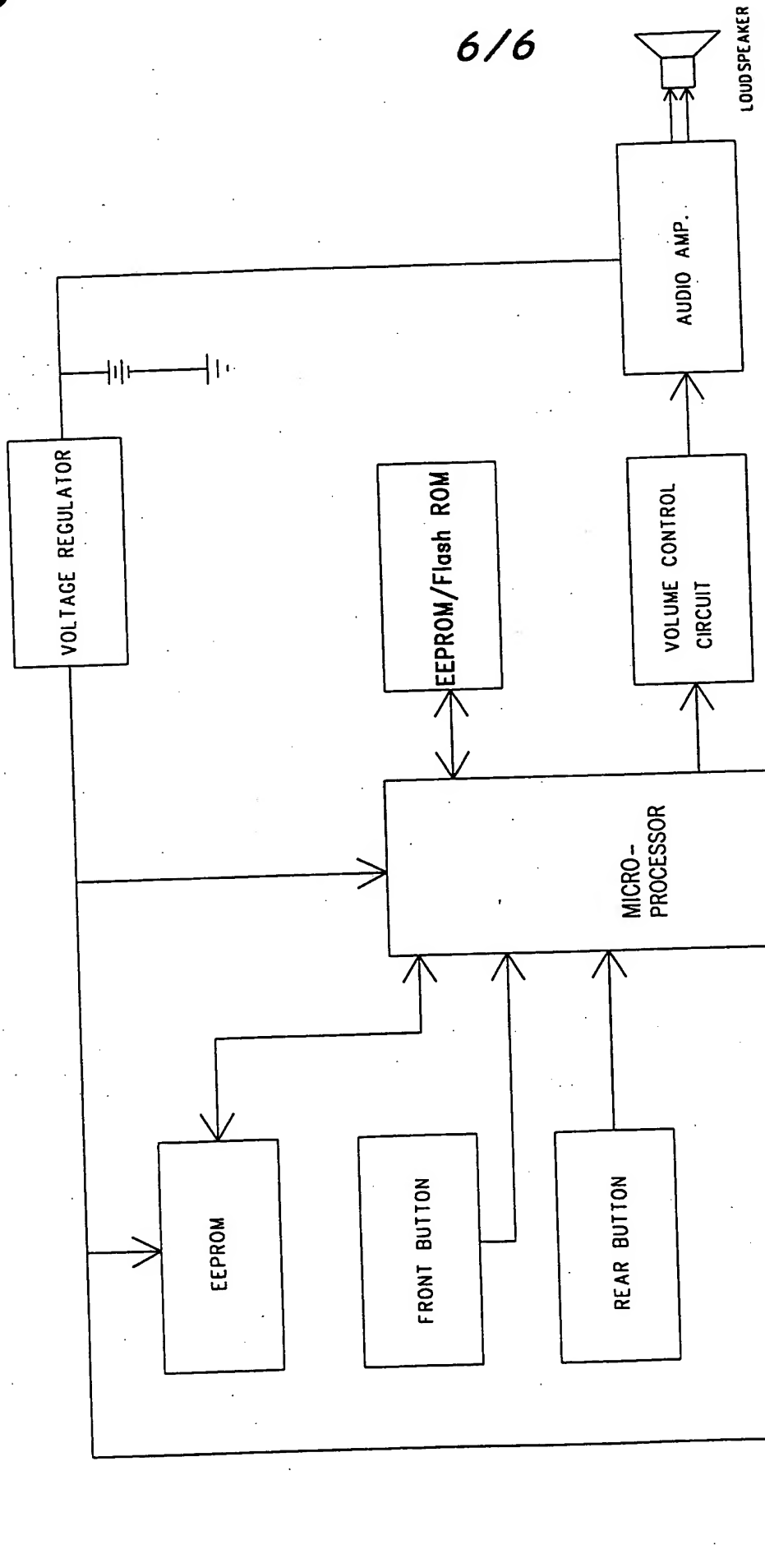
LOUDSPEAKER
AUDIO AMP.
VOLTAGE REGULATOR
EEPROM/Flash ROM
VOLUME CONTROL CIRCUIT
MICRO-PROCESSOR
EEPROM
FRONT BUTTON
REAR BUTTON
RF RECEIVER

Figure 8